

**L-P-389a**

May 27, 1964

**SUPERSEDING**

Int. Fed. Spec. L-P-003S9 (Army-SigC)

April 5, 1962

**FEDERAL SPECIFICATION****PLASTIC MOLDING MATERIAL, FEP FLUOROCARBON, MOLDING AND EXTRUSION**

*This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.*

**1. SCOPE AND CLASSIFICATION**

1.1 Scope. This specification covers FEP fluorocarbon (fluorinated ethylene propylene copolymer) molding and extrusion material suitable for use in dielectric applications (see 6.1). For the purpose of this specification, the term "FEP" shall be used when referring to FEP fluorocarbon molding and extrusion material.

**1.2 Classification.**

1.2.1 Types. Plastic molding and extrusion material FEP fluorocarbon covered by this specification shall be of the following types as specified in the contract or order (see 6.2):

Type I—extrusion grade

Type II—molding grade

**2. APPLICABLE SPECIFICATIONS, STANDARDS, AND OTHER PUBLICATIONS**

2.1 Specifications and standards. The following specifications and standards, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

**Federal Specifications:**

PPP-B-576—Box, Wood, Cleated, Veneer, Paper Overlaid.

PPP-B-535—Boxes, Wood, Wirebound.

PPP-B-591—Boxes, Fiberboard, Wood-Cleated.

PPP-B-601—Boxes, Wood, Cleated-Plywood.

PPP-B-621—Boxes, Wood, Nailed and Lock-Corner.

PPP-B-636—Box, Fiberboard.

PPP-B-640—Boxes, Fiberboard, Corrugated, Triple Wall.

**Federal Standards:**

Fed. Std. No. 102—Preservation, Packaging, and Packing Levels.

Fed. Std. No. 123—Marking for Domestic Shipment (Civilian Agencies).

Fed. Test Method Std. No. 406—Plastics: Method of Testing.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

(Single copies of this specification and other product specifications required by activities outside the Federal Government for bidding purposes are available without charge at the General Services Administration Regional Offices in Boston, New York, Washington, D. C., Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, Los Angeles, and Seattle, Wash.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

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*Military Standard:***MIL-STD-129—Marking for Shipment and Storage.**

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

**2.2 Other publications.** The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

*American Society for Testing and Materials (ASTM) Standards:*

- D 150-59T—A-C Capacitance, Dielectric Constant, and Loss Characteristics of Electrical Insulating Materials.
- D 618-61—Conditioning Plastics and Electrical Insulating Materials for Testing.
- D 638-61T—Tensile Properties of Plastics.
- D 792-60T—Specific Gravity and Density of Plastics.
- D 1238-62T—Measuring Flow Rates of Thermoplastics by Extrusion Plastometer.

D 1505-60T—Density of Plastics by the Density-Gradient Technique.

D 1708-59T—Tensile Properties of Plastics by the Use of Microtensile Specimens.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia 3, Pennsylvania.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

**3. REQUIREMENTS**

**3.1 Material.** The material shall be unfilled FEP (fluorinated ethylene propylene copolymer) so formulated as to meet the requirements of this specification.

**3.1.1 Color.** Unless otherwise specified (see 6.2), FEP shall contain no color pigment.

**3.1.2 Form.** FEP shall be in the form of pellets.

**3.2 Property values.** Unless otherwise specified (see table I (melt flow rate and melting point)), the values obtained from each set of specimens for any property shall be averaged (see 4.5.2.1), and the results so obtained shall meet the requirements specified in table I.

**TABLE I.—Property values**

Property (see table IV)	Value required	
	Type I	Type II
Density, range, inclusive, D <sub>25°C</sub> , g/ml	2.14 to 2.17	2.14 to 2.17
Tensile strength, minimum, p.s.i.	2,500	2,100
Elongation, minimum, percent	275	240
Dielectric constant, maximum, c.p.s.:		
10 <sup>3</sup>	2.15	2.15
10 <sup>6</sup>		
10 <sup>9</sup>		
Dissipation factor, maximum, c.p.s.:		
10 <sup>3</sup>	0.0003	0.0003
10 <sup>6</sup>	0.0007	0.0007
10 <sup>9</sup>	0.001	0.001
Melt flow rate, grams per 10 minutes:		
Minimum	4	5
Maximum	12	12
Melting point, minimum, °C <sup>1</sup>	250	240

<sup>1</sup> FEP does not have a sharp melting point (see 4.5.3.5.3).

#### 4. SAMPLING, INSPECTION, AND TEST PROCEDURES

**4.1 Responsibility for inspection.** Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

**4.1.1 Test equipment and inspection facilities.** Test equipment and inspection facilities shall be of sufficient accuracy, quality, and quantity to permit performance of the required inspection. The supplier shall establish calibration of inspection equipment to the satisfaction of the Government.

**4.2 Classification of inspection.** The examination and testing of FEP shall be classified as follows:

Acceptance inspection. (see 4.4.)

- (1) Inspection of product for delivery. (see 4.4.1.)
- (2) Inspection of preparation for delivery. (see 4.4.2.)

**4.3 Inspection conditions.** Unless otherwise specified herein, inspection shall be made at room temperature (see ASTM D 618-61) and at ambient humidity and pressure. In the event of a dispute concerning conditions, the standard conditions of ASTM D 618-61 shall be used.

**4.4 Acceptance inspection.**

**4.4.1 Inspection of product for delivery.** Inspection of product for delivery shall consist of batch inspection (see 4.4.1.2) and periodic-batch inspection (see 4.4.1.3).

**4.4.1.1 Batch.** A batch of FEP (see 3.1 to 3.1.2, inclusive) shall be defined as a unit

of product prepared for shipment, and may consist of a uniform blend of two or more "production runs" of FEP of the same color, when applicable.

**4.4.1.2 Batch inspection.** Batch inspection shall consist of the tests specified in table II.

TABLE II.—*Batch inspection*

Test	Requirement	Test method
Density . . . . .	(see table I)	(see table IV)
Melt flow rate . .		
Melting point . .		

**4.4.1.2.1 Sampling plan.** Batch sampling and inspection shall be made on each batch (see 4.4.1.1), and shall be the basis for acceptance or rejection of the batch (see 4.5.1).

**4.4.1.3 Periodic-batch inspection.** Periodic-batch inspection shall consist of the tests specified in table III. Shipment shall not be held up pending results of the inspection.

TABLE III.—*Periodic-batch inspection*

Test	Requirement	Test method
Tensile strength and elongation	(see table I)	(see table IV)
Dielectric constant and dissipation factor		

**4.4.1.3.1 Sampling plan.** Periodic-batch sampling and inspection shall be made on the first batch (see 4.4.1.1) prepared for shipment, and on every 10th batch thereafter, or once every 6 months, whichever is more frequent (see 4.5.1).

**4.4.1.3.2 Noncompliance.** If a batch fails to pass periodic-batch inspection, the supplier shall take corrective action on the materials or process, or both, as warranted, and on all batches which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials, processes, etc, and which are considered subject to the same failure. Acceptance of the product shall be discontinued until corrective action, acceptable to

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the Government, has been taken. After the corrective action has been taken, periodic-batch inspection shall be repeated. Batch inspection may be reinstituted; however, final acceptance shall be withheld until the periodic-batch reinspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure and the corrective action taken shall be furnished to the contracting officer.

**4.4.1.4 Rejection.** Failure to comply with any of the requirements of this specification shall be cause for rejection of the batch represented.

**4.4.2 Inspection of preparation for delivery.** Sample items and packs shall be selected and inspected to verify conformance with the requirements in section 5 of this specification.

#### 4.5 Methods of test.

**4.5.1 Sampling.** Three representative samples of equal size shall be selected from each batch prior to packaging. If sampling is done after packaging, three containers (packages or drums) shall be selected at random from each batch (see 4.4.1.1). Containers shall be opened carefully, making sure that there is no contamination from scale, paint, shattered heads, torn liners, or from any other cause. The three representative samples shall be composited, placed in a clean dry metal or glass container, and tightly closed.

#### 4.5.2 Specimens.

**4.5.2.1 Number and form.** Five specimens or sample charges of the form specified in the applicable document or paragraph (see table IV) shall be prepared as specified in 4.5.2.3. Unless otherwise specified herein, specimens, as applicable, shall be  $0.055 \pm 0.0030$  inch thick.

**4.5.2.2 Additional specimens.** When the test result of a specimen deviates from the

average of the other specimens by more than four times the average deviation of the other specimens, that specimen shall be discarded and another specimen from the same composite shall be tested and used in its place.

**4.5.2.3 Preparation.** A "picture-frame" type, compression-molding chase shall be used. The chase size shall be 2 by 6 by 0.0625 inches and shall be of stainless steel. The mold-release agent shall be clean aluminum foil 0.005 to 0.007 inch, inclusive, thick. The molding plates shall be two polished, chromium-plated, ferrotype plates such as are used in photography. The plates shall be at least 0.04 inch thick and shall have an area adequate to cover the chase. Preparation of the sheets shall be subdivided into two steps, molding and annealing, as follows:

- (a) **Molding**—The chase shall be placed on top of one of the molding plates that has been smoothly covered with a sheet of foil. Place an appropriate amount of FEP in a mound in the middle of the chase to provide a thickness as described in 4.5.2.1. A second sheet of foil shall be placed on top of the FEP. The top molding plate shall then be added. The assembly shall be placed in a compression-molding press which shall have cored platens which have been heated to  $340^\circ \pm 5^\circ\text{C}$ . ( $644^\circ \pm 9^\circ\text{F}$ .) and which are equipped for cooling. The platens shall be brought into incipient contact with the mold assembly and held for  $5 \pm 0.5$  minutes at this temperature. A pressure of  $1,060 \pm 70$  kilograms ( $15,000 \pm 1,000$  pounds per square inch gage) shall then be applied for 1 minus zero and plus 0.5 minute.
- (b) **Annealing**—While the sheet is under pressure, the platens shall be cooled to  $150^\circ \pm 10^\circ\text{C}$ . ( $302^\circ \pm 18^\circ\text{F}$ .) at a rate of  $10^\circ \pm 1^\circ\text{C}$ . ( $18^\circ \pm 1.8^\circ\text{F}$ .) per minute. Water, air, or a combina-

tion of the two may be used to establish this cooling rate. The chase shall be removed from the press and the sheet shall be separated from the chase and allowed to cool in air at room ambient temperature.

**4.5.3 Test methods.** Test methods shall be as specified in table IV.

**4.5.3.1 Density.** Specimens shall be approximately 1 inch by 1-1/2 inches, and shall be tested in accordance with method A of ASTM D 792-60T, or in accordance with ASTM D 1505-60T. Specimens shall be conditioned in accordance with procedure A of ASTM D 618-61 for at least 4 hours. Two drops of a wetting agent shall be added to the water to reduce surface tension and to insure complete wetting of specimen.

**4.5.3.2 Tensile strength and elongation.** Specimens shall be cut with a microtensile-type die in accordance with ASTM Publication D 1708-59T, except that the radius shall be changed from 1/8 to 3/16 inch. Specimens shall be conditioned in accordance with procedure A of ASTM D 618-61 for at least 4 hours. Speed C of ASTM D 638-61T shall be used. Initial jaw separation shall be  $0.875 \pm 0.005$  inch. The specimens shall be clamped with equal lengths in each jaw.

**4.5.3.2.1 Elongation determination.** Elongation shall be calculated (see 4.5.3.2.1.1) from the chart<sup>1</sup> used in determining tensile strength. On the chart, drop a perpendicular from the breakpoint to the time axis. Meas-

ure the distance along the time axis from the foot of this perpendicular to the beginning of the load-time curve.

<sup>1</sup> A full-scale load of 50 pounds has been found suitable. If the specimens break quickly, the chart speed may be increased so that each curve covers at least 2 inches on the time axis of the chart.

#### 4.5.3.2.1.1 Calculations.

$$\text{Elongation, percent} = \frac{c}{0.875 \times m} \times 100$$

Where:

$c$  = Distance on chart in inches.

$m$  = Chart-speed magnification =

$$\frac{\text{chart speed}}{\text{crosshead speed}} \quad (\text{both in same units}).$$

0.875 inch = Initial jaw separation

**4.5.3.3 Dielectric constant and dissipation factor.** Specimens shall be conditioned in accordance with procedure D of ASTM Publication D 618-61.

#### 4.5.3.4 Melt flow rate.

**4.5.3.4.1 Sample charges.** Sample charges shall consist of pellets or pieces of approximately the same suitable size, cut from molded or extruded forms. Strips about 1/4 inch by 3 inches may be conveniently handled.

**4.5.3.4.2 Apparatus.** The apparatus shall consist of the following items:

- (a) An extrusion plastometer, as described in ASTM Publication D 1238-62T, and modified by the use of "Stellite" alloy, or equal, for the

TABLE IV.—Test methods<sup>1</sup>

Test (see table I)	Method number of Fed. Test Method Std. No. 406	ASTM publication or paragraph	Modified by paragraph
Density .....	5011	D 792-60T	4.5.3.1
Tensile strength and elongation .....	1011	D 638-61T	4.5.3.2 to 4.5.3.2.1.1. incl.
Dielectric constant and dissipation factor .....	4021	D 150-59T	4.5.3.3
Melt flow rate .....	—	4.5.3.4	—
Melting point .....	—	4.5.3.5	—

<sup>1</sup> Either Fed. Test Method Std. No. 406 or ASTM publications may be used, as applicable.



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cylinder lining, the orifice, and the piston tip (see 6.4).

- (b) An analytical balance having a capacity of 200 grams and weights for weighing the sample charges to the nearest 0.0001 gram.
- (c) A stopwatch.

## 4.5.3.4.3 Procedure.

**4.5.3.4.3.1 Temperature calibration.** The melt temperature,  $372^{\circ} \pm 1^{\circ}\text{C}$ . ( $701.6^{\circ} \pm 1.8^{\circ}\text{F}$ .), is the temperature measured in the melt 0.5 inch above the orifice. This temperature may be obtained by controlling the temperature measured in the thermometer well at approximately  $380^{\circ}\text{C}$ . ( $716^{\circ}\text{F}$ .). Prior to testing, the plastometer temperature shall be calibrated as follows:

- (a) With the orifice in place, insert a standardized thermocouple<sup>2</sup> through the orifice from the bottom of the plastometer to a point 0.5 inch above the top of the orifice.
- (b) Place  $5.0 \pm 0.5$  grams of FEP (see 4.5.3.4.1) in the plastometer, compact with the piston, and wait  $10 \pm 0.5$  minutes for the melt temperature to reach equilibrium. The necessary adjustments shall be made in the temperature controller to bring the melt temperature to  $372^{\circ} \pm 1^{\circ}\text{C}$ . ( $701.6^{\circ} \pm 1.8^{\circ}\text{F}$ .).
- (c) Repeat (a) and (b) and record temperature versus time at 1-minute intervals for the first 10 minutes. The FEP should reach the melt temperature within 5 minutes.
- (d) With the FEP in the plastometer for an elapsed time of 10 minutes for

each point measured, determine the melt temperature at 1/4-inch intervals from 1/4 inch to 2 inches, inclusive, above the orifice. The entire temperature profile shall be within a range of  $2^{\circ}\text{C}$ . ( $3.6^{\circ}\text{F}$ .). (This precision is readily obtained by proper insulation of the sides, bottom, and top of the plastometer.)

**4.5.3.4.3.2 Method.** The plastometer shall be clean and level. The autotransformer settings shall be such that the controlled heater is off and on for approximately equal periods. Place  $5.0 \pm 0.5$  grams of FEP in the plastometer. When FEP is in pellet form, the pellets shall be poured into the plastometer through the funnel and pushed down with the charging rod. As soon as the FEP has been charged, wipe off the top of the plastometer and place the piston in position downward until resistance is met (this will compact the FEP). Start the stopwatch. Using the stopwatch, allow the FEP to heat for an elapsed time of exactly 5 minutes to obtain equilibrium conditions. Stop and reset the stopwatch. The piston shall be loaded accordingly: Type I—5,000 grams and Type II—2,000 grams. Allow the FEP to extrude for 30 seconds, and then, without stopping the watch, cut off the extrudate cleanly (see 6.4.2) with a spatula at the exact moment that the second hand of the watch reaches zero. This portion shall be discarded. Collect five successive cuts at 1/2-minute intervals. After the extrudates have cooled to room temperature, the individual cuts shall be weighed to the nearest milligram.

**4.5.3.4.3.3 Calculations.** The melt flow rate shall be computed by multiplying the average weight of the extrudates (in grams per 1/2 minute) by 20.

## 4.5.3.5 Melting point.

**4.5.3.5.1 Specimens.** A suitable specimen, 1/2 inch to 3/4 inch, inclusive, long, by 0.050 inch to 0.070 inch inclusive, wide, by 0.010 inch to 0.015 inch inclusive, thick, shall be shaved from the molded sheet.

<sup>2</sup> Suitable standards for calibrating the thermocouple are:

	Melting point:
Lead .....	$327.5^{\circ}\text{C}$ . ( $621.5^{\circ}\text{F}$ .)
Potassium	
dichromate .....	$398.0^{\circ}\text{C}$ . ( $748.4^{\circ}\text{F}$ .)
Zinc .....	$419.4^{\circ}\text{C}$ . ( $786.9^{\circ}\text{F}$ .)

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**4.5.3.5.2 Apparatus.** The apparatus shall consist of the following items:

- (a) Melting-point apparatus (see 6.5) with a special thermometer (range 200° to 400°C. inclusive (392° to 752°F. inclusive) ) having 1°C. (1.8°F.) divisions and calibrated for melting-point determinations.
- (b) Three round cover glasses, 18 millimeters in diameter.
- (c) An aluminum disk, 0.187-inch thick, with an outside diameter of 1-1/2 inches, and having a tapered center hole with a top diameter of 0.312 inch and a bottom diameter of 0.437 inch.

**4.5.3.5.3 Procedure.** The specimen shall be placed between two cover glasses. The assembly shall be placed in the well of the apparatus. Another cover glass shall be placed over the assembly. The aluminum disk shall be added, making certain that the large end of the center hole is towards the bottom. The leads from the autotransformer shall be inserted into the apparatus. Set the autotransformer to give a maximum voltage of 24 volts so that the temperature will rise at a rate of 25°C. (45°F.) per minute. When the temperature reaches 235°C. (455°F.), the voltage shall be decreased so that the rate of temperature rise is 1°C. (1.8°F.) per minute. The specimen shall be observed at 1-minute (1°C. (1.8°F.)) intervals. The temperature at which the specimen changes from a solid to a melt along the outer edges shall be recorded as the melting point. (There is a softening point about 10°C. (18°F.) lower than the melting point.)

## 5. PREPARATION FOR DELIVERY

For civil agency procurement, the definitions and applications of the levels of packaging and packing shall be in accordance with Fed. Std. No. 102.

### 5.1 Preservation and packaging (see 6.2).

**5.1.1 Level A.** Material in the form of pellets shall be packaged as specified and af-

forded preservation in accordance with MIL-P-116.

**5.1.2 Level C.** Material in the form of pellets shall be afforded preservation and packaging in accordance with the supplier's commercial practice.

### 5.2 Packing (see 6.2).

**5.2.1 Level A.** The packaged item shall be packed in containers conforming to any of the following specifications at the option of the supplier:

Specification	Container	Class or style
PPP-B-576 ..Box, Wood, Cleated, Veneer Paper Overlaid		Class 2
PPP-B-585 ..Boxes, Wood, Wire-bound		Class 2 or 3
PPP-B-591 ..Boxes, Fiberboard, Wood-Cleated		Style A or B
PPP-B-601 ..Boxes, Wood, Cleated-Plywood		Style A or B
PPP-B-621 ..Boxes, Wood, Nailed and Lock-Corner		Class 2
PPP-B-636 ..Box, Fiberboard		Class 2
PPP-B-640 ..Boxes, Fiberboard, Triple Wall		Class 2

Box closures and strapping shall be as specified in the applicable box specification or appendix thereto. Banding (reinforcement requirements), excluding metal, is required and will be applied in accordance with the provisions outlined in the appendix to the specification. The gross weight of wood boxes shall not exceed 200 pounds; contents of fiberboard boxes shall not exceed the limitations of the applicable box specification.

**5.2.2 Level B.** The item shall be packed in accordance with paragraph 5.2.1 except that the containers shall be constructed for domestic requirements. Fiberboard boxes shall be banded as prescribed in the appendix of the box specification. Box closures shall be as specified in the applicable box specification or appendix thereto.

**5.2.3 Level C.** The packaged item shall be packed in containers of the type, size, and

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kind commonly used for the purpose, in a manner that will insure acceptance by common carrier and safe delivery at destination. Shipping containers shall comply with the Uniform Freight Classification Rules, or regulations of other carriers as applicable to the mode of transportation.

**5.2.4 General.** Exterior containers shall be uniform in shape and size, shall be of minimum cube and tare consistent with the protection required, and shall contain identical items.

### 5.3 Marking.

**5.3.1 Civil agencies.** In addition to any special marking required by the contract or order, unit packages, intermediate packages, and exterior shipping containers shall be marked in accordance with Fed. Std. No. 123.

**5.3.2 Military agencies.** In addition to any special marking required by the contract or order, unit packages, intermediate packages, and exterior shipping containers shall be marked in accordance with MIL-STD-129.

## 6. NOTES

**6.1 Intended use.** FEP has electrical properties comparable to those of polytetrafluoroethylene. FEP may be utilized in applications requiring continuous use at temperatures up to 204.5°C. (400°F.), and where weather-resistant, chemically-resistant, and nonflammable material is needed. It can be fabricated by conventional thermoplastic methods.

**6.2 Ordering data.** Purchasers should exercise any desired options offered herein and procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type (see 1.2.1).
- (c) Color, if applicable (see 3.1.1).
- (d) Information for preparation for delivery (see section 5).

**6.3 Transportation description.** Transportation descriptions and minimum weights applicable to this commodity are:

#### *Rail:*

Plastics, granular

Carload minimum weights 10,000, 20,000 and 30,000 pounds, subject to Rule 34, Uniform Freight Classification.

#### *Motor:*

Plastic pellets.

Truckload minimum weight 30,000 pounds, subject to Rule 115, National Motor Freight Classification.

### 6.4 Melt flow rate.

**6.4.1 Extrusion plastometer.** "Stellite" alloy, grade No. 19, trademark of the Haynes Stellite Division of Union Carbide Corporation, Kokomo, Indiana, has been found satisfactory for the cylinder lining, the orifice, and the piston tip. A plastometer, available from the F. F. Slocumb Corporation, Wilmington, Delaware, or the Tinius Olsen Testing Machine Company, Willow Grove, Pennsylvania, has been found suitable.

**6.4.2 Cutting of extrudate.** The tip of the spatula should be passed upward along one side of the beveled hole, then lightly across the bottom of the hole. This cutting should be done quickly and neatly in order to obtain the best precision; a light cutting force should be used to avoid excessive wear on the orifice opening. The neatness of the cut may be checked by observing the manner in which the succeeding portion is extruded. If the cut is clean and sharp, the succeeding portion will be extruded straight. If not, it will tend to curl and stick to one side or the other of the beveled hoe. It may be necessary to reshape the end of the spatula slightly to obtain the best results.



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TABLE V.—*Typical property values of FEP*

Property	Value	ASTM test method
Impact strength ft. lb. per inch of notch (Izod):		D 256-56
65°F. ....	2.9	
73°F. ....	no break	
Flexural modulus, 73°F., psi .....	95,000	D 790-61
Tensile modulus, minimum, psi .....	3,500	D 882-61T
Deformation under load, 73°F., 1000 psi, 24 hrs, percent .....	1.8	D 621-59
Coefficient of linear thermal expansion per °F., -100°F. to 160°F. ..	4.6—5.8 x 10 <sup>-5</sup>	D 696-44
Thermal Conductivity, cal/sec/cm <sup>2</sup> /°C./cm .....	5 x 10 <sup>-4</sup>	C 177-45
Specific heat, cal/°C./gm .....	0.28	C 351-61
Continuous use temperature:		—
°C. ....	205	
°F. ....	400	
Dielectric strength, ST, 10 mil, v/mil .....	2,100	D 149-61
Volume resistivity, ohm-cm .....	10 <sup>18</sup>	D 257-61
Water absorption, percent .....	0.01	D 570-59aT
Hardness, Durometer .....	D 55	D 1706-61
Coefficient of friction .....	0.09	D 1894-61T

6.5 Melting-point apparatus. The Fisher-Johns Melting Point Apparatus, catalog No. 12-144, available from the Fisher Scientific Company, Pittsburgh, Pennsylvania, has been found suitable.

6.6 Typical properties. Typical properties of FEP are described in table V. These property values are not to be used for specification purposes since they represent average values.

#### MILITARY CUSTODIANS:

Army—EL

Navy—Ships

Air Force—ASD

Preparing Activity:

Army—Sig C

